Five -Year Review Report

Fourth Five-Year Review Report

for

Waverly Groundwater Contamination Site

Lancaster County
Waverly, Nebraska

August 2009

Prepared By:

U.S. Environmental Protection Agency
Region 7
Kansas City, Kansas

Approved By:

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Superfund Division Director
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Date:

8/13/09

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List of Abbreviations

CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CCC	Commodity Credit Corporation
EPA	U.S. Environmental Protection Agency
ERA	Expedited Response Action
ESD	Explanation of Significant Difference
g/s	Grams per Second
GWEX	Groundwater Extraction Well
IRIS	Integrated Risk Information System
mg/kg	Milligrams per Kilogram
NDEQ	Nebraska Department of Environmental Quality
NHHS	Nebraska Health and Human Services
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
O&M	Operation & Maintenance
PWS	Public Water Supply
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SGWEX	Supplementary Groundwater Extraction Well
μg/L	Micrograms per Liter
USDA	U.S. Department of Agriculture
VES	Vapor Extraction System
VOC	Volatile Organic Compound

Executive Summary

The remedy for the Waverly Groundwater Contamination site (Site), as stated in the Record of Decision (ROD), addresses the principal threat through the remediation of groundwater and soil contamination by eliminating or reducing the risks posed by the Site through treatment.

The Environmental Protection Agency chose a pump and treat system to clean up the Site. The remedy also includes a groundwater extraction and air stripping system and an active soil gas extraction system. The groundwater extraction and air stripping system consisted of groundwater extraction wells and air strippers that removed contaminants from the aquifer, contained the spread of the contaminated groundwater, and removed and treated the contaminated groundwater. An active soil gas extraction system (Soil Vapor Extraction) removed the contaminants from the soils above the water table on the former facility.

The first five-year review report for this Site was completed by EPA Region 7 Superfund Division in September 1993. It concluded that, "the existing system has been effective in controlling the migration of contaminated groundwater from the facility and is progressing toward clean up and restoration of the aquifer." Therefore, the remedy at the Site is expected to be protective of human health and the environment and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

The second five-year review report was completed by EPA Region 7 Superfund Division in September 1999. It concluded that although hazardous substances and pollutants remained on-site at levels above the compliance levels outlined in the ROD, the remedy at the Site is expected to be protective of human health and the environment; and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

The third five-year review report was completed by EPA Region 7 Superfund Division in September 2004. It concluded that although hazardous substances and pollutants remained on-site at levels above the compliance levels outlined in the ROD, the remedy at the Site is expected to be protective of human health and the environment and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

This fourth and final five-year review report's conclusion is that because the remedial actions at the Site are protective, the Site is protective of human health and the environment. This final five-year review also concludes that the Site is ready for unlimited reuse.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Waverly Groundwater Contamination		
EPA ID *(from WasteLAN)*: NED980862718		
Region: 7	**State:** NE	**City/County:** Waverly/Lancaster
SITE STATUS		
NPL status: ☐ Final **X** Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☐ Operating **X** Complete		
Multiple OUs? ☐ YES **X** NO	**Construction completion date:** 03 / 29 / 1994	
Has site been put into reuse? X YES ☐ NO		
REVIEW STATUS		
Reviewing agency: X EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author name: Jeffrey L. Field		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA Region 7	
Review period: February 2009 – July 2009		
Date(s) of site inspection: July 7, 2009		
Type of review: ☐ Statutory **X** Policy (**X**) Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion)		
Review number: ☐ 1 (first) ☐ 2 (second) ☐ 3 (third) **X** Other (Final)		
Triggering action: ☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____ ☐ Construction Completion **X** Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: 09/30/2004		
Due date *(five years after triggering action date)*: 09/30/2009		

Five-Year Review Summary Form, cont'd.

Issues:

None.

Recommendations and Follow-up Actions:

Since quarterly groundwater monitoring conducted at these monitoring points since November 2006 have shown that contaminant levels remain well below the compliance levels described in the ROD, future groundwater monitoring will be discontinued.

Protectiveness Statement(s):

The remedy at the Site is protective of human health and the environment.

Other Comments:

None.

Waverly Groundwater Contamination Site
Waverly, Nebraska
Fourth Five-Year Review Report

1. Introduction

The purpose of the five-year review is to determine whether the remedy at the site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency is preparing this five-year review report pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) § 121 and the National Oil and Hazardous Substances Pollutant Contingency Plan (NCP). CERCLA states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The United States Environmental Protection Agency (EPA) Region 7 conducted this five-year review of the remedy implemented at the Waverly Groundwater Contamination site (Site) in Waverly, Nebraska. This review was conducted by the Remedial Project Manager (RPM) for the entire site from February 2009 through June 2009. This report documents the results of the review.

This is the fourth five-year review for the Site. The triggering action for this policy review is the signature date of the previous five-year review report. The five-year review is

required due to the fact that as of the last five-year review hazardous substances, pollutants, or contaminants remained at the Site above levels that allowed for the unlimited use and unrestricted exposure at the Site.

2. Site Chronology

Event	Date
Site Discovery	03/01/1983
Hazard Ranking System Package	04/09/1984
Proposed to NPL	10/15/1984
NPL Potentially Responsible Party Search	05/15/1985
Final Listing on NPL	06/10/1986
Preliminary Assessment 1	01/22/1987
PRP Remedial Investigation/Feasibility Study	04/24/1987
Preliminary Assessment/Site Inspection	12/24/1987
Consent Agreement	05/27/1988
Site Inspection	12/22/1989
Proposed Plan	08/01/1990
Record of Decision	09/26/1990
1st Five-Year Review Completed	09/27/1993
Preliminary Close Out Report	03/29/1994
2nd Five -Year Review Completed	09/30/1999
Site Inspection Completed	07/06/2004
3rd Five-Year Review Completed	09/28/2004
Explanation of Significant Difference	03/10/2005
Final Remedial Action Report	06/28/2006
Final Close Out Report	08/02/2006
Notice of Deletion NPL	09/07/2006
Final Deletion NPL	11/20/2006

Quarterly Sampling Report Reviews	2006 – 2009
Site Inspection Completed	07/07/2009

3.0 Background

3.1 Physical Characteristics

The Site is located in Lancaster County in southeastern Nebraska, in and near the city of Waverly. Figure 1 shows the general location of the Site in Township 11 North and Range 8 East of Lancaster County. Waverly is located along State Highway 6, approximately 10 miles northeast of Lincoln, Nebraska. The Site property, currently owned by the Lancaster County Engineering Department, is located along the south side of Oldfield Street, just west of North 141st Street (Figure 2). The Site legal description is as follows: Lot 158, I.T. in the SW 1/4 of Section 16, Township 11 North, Range 8 East of the 6th Prime Meridian, Lancaster County, Nebraska.

3.2 Land and Resource Use

The population of the city of Waverly is approximately 2,000. The land immediately north of the Site is used primarily for agriculture, and the land immediately to the south is residential. The city of Waverly obtains all of its drinking water supply from municipal wells that tap the groundwater aquifer.

The Waverly aquifer is the principal near-surface aquifer in the Waverly area. The aquifer occurs in fluvial sands deposited in a bedrock paleovalley. The Waverly aquifer is divided into an upper and lower aquifer at the Site, separated by a barrier clay layer. North of the Site, however, only one aquifer was documented in the driller's logs at a number of well locations.

3.3 History of Contamination

The Commodity Credit Corporation/U.S. Department Agriculture (CCC/USDA) operated a grain storage facility in Waverly between 1952 and 1974. The facility consisted of grain storage structures (approximately 100 bins and 13 Quonset huts) on concrete foundations. The fumigant "80/20" was used at the facility between approximately 1955 and 1965. The fumigant is reported to have been composed of 80 percent carbon tetrachloride and 20 percent carbon disulfide. Trace amounts of chloroform also may have been present in the 80/20 fumigant as a by-product of the production of carbon tetrachloride.

Since 1975, the former CCC/USDA grain storage facility property has been owned by Lancaster County which operates a district office and maintenance facility on the premises. The facility consists of gravel parking areas with large areas covered by piles of road maintenance materials and construction materials.

In 1982, EPA sampled the Waverly municipal wells as part of a synthetic organic compound chemicals survey and found that public water supply (PWS) wells 1 and 3 were contaminated with up to 200 micrograms per liter (µg/L) of carbon tetrachloride and 7.5 µg/L of chloroform. After the 1983 installation of a new supply well, PWS 1 and PWS 2 were placed on standby status and PWS 3 was taken out of service. Additional municipal wells were subsequently installed south of the Site.

On October 15, 1984, EPA proposed that the Site be placed on the National Priorities List (NPL). The listing of the Site became final on June 10, 1986.

3.4 Initial Response

After the discovery of contamination, PWS 1 and PWS 2 were relegated to standby status, and PWS 3 was removed from service. Between 1982 and 1987, four additional PWS wells were installed south of the Site. Two of these wells are two miles southwest of town, outside the study area, and outside the known extent of the contaminated plume associated with the Site.

In 1985, 47 wells near the Site were sampled for a wide range of parameters including volatile organic compounds (VOCs), semi-volatile organic compounds, metals, and pesticides as part of the characterization of the Site.

In May 1986, EPA developed an engineering evaluation and cost analysis report outlining an Expedited Response Action (ERA) including pumping and treating with air stripping technology and soil gas extraction. Design of the system was completed in May 1987, and a public meeting was held in Waverly with the mayor and city council to receive their comments on the ERA system.

EPA began operation of the current ERA systems at the Site in February 1988. A compliance agreement between CCC/USDA and EPA went into effect in May 1988. In June 1988, CCC/USDA took over the operation and maintenance (O&M) of the ERA. In September 1990, the Record of Decision (ROD) was issued for Waverly. CCC/USDA was responsible for implementing the actions described in the ROD for the Site.

3.5 Basis for Taking Action

The basis for taking action at this Site under CERCLA authorities is a concern for human

exposure to carbon tetrachloride and chloroform through ingestion of contaminated groundwater through drinking water wells, exposure through inhalation from carbon tetrachloride in the vapor phase, and dermal contact from contaminated soils.

4.0 Remedial Actions

4.1 Remedy Selection

The principal threat at the Site is the carbon tetrachloride and chloroform contamination in the Waverly aquifer which is used by the city as a source of drinking water. The selected remedy described in the ROD included:

- Extraction of the contaminated groundwater using the existing groundwater extraction well (GWEX)
- On-site treatment of the extracted groundwater using existing air strippers
- Active soil vapor extraction using the existing system of soil vapor extraction wells and continued investigation of the contaminant plume and monitoring of the system to determine the effectiveness of the remedy

To address the potential risks, the following remedial action objectives (RAOs) were identified in the ROD:

- Prevent potential exposure to contaminated groundwater
- Protect uncontaminated groundwater for future use by preventing future migration of the contaminated groundwater plume
- Restore the contaminated aquifer for future use as a source of drinking water by reducing the carbon tetrachloride and chloroform concentrations below health-based criteria described in the ROD

In addition to the RAOs, EPA required CCC/USDA to conduct an additional Site investigation program. The purpose of the investigation was to verify the downgradient performance of the ERA system and further characterize the hydrogeologic setting. The main objectives of this ROD Site investigation were to:

- Install monitoring well clusters (nested wells) to the north and northwest to delineate the magnitude and extent of contamination along this potential migration route
- Conduct a survey of existing wells north, northeast, and northwest (downgradient) of the Site

- Conduct a pumping/recovery aquifer test using the existing GWEX and monitoring wells to evaluate the hydraulic properties of the aquifer

- Determine the suitability of using existing monitoring wells as extraction wells

- Continue sampling of the existing and new monitoring wells, water supply wells, domestic wells, vapor extraction wells, soil gas monitoring wells, air compliance points, and GWEX as specified in the performance criteria

- Develop a groundwater flow and transport model of sufficient detail to determine the correct pumping rate for GWEX to enable it to capture the entire area of the plume that is above the compliance levels described in the ROD

- Investigate the potential uses for the treated water discharged from GWEX and the air stripping system

4.2 Remedy Implementation

In May 1986, EPA developed an engineering evaluation and cost analysis report outlining an ERA including pumping and treating with air stripping technology and soil gas extraction. Design of the systems was completed in May 1987, and a public meeting was held in Waverly with the mayor and city council to receive their comments on the ERA system.

EPA began operation of the ERA system at the Site in February 1988. A compliance agreement between CCC/USDA and EPA went into effect in May 1988. In June 1988, CCC/USDA took over O&M of the ERA. In September 1990, the ROD was issued for Waverly. CCC/USDA was responsible for implementing the actions described in the ROD for the Site.

In 1991-1992, CCC/USDA conducted additional Site investigations at Waverly to satisfy the requirements of the ROD. The principal conclusions of these Site investigations were as follows:

- Groundwater beneath the Site flows in a north-northeast direction

- Groundwater contamination was present only in the upper aquifer

- A plume of groundwater contaminated with carbon tetrachloride and chloroform was present to the northeast of the Waverly ERA Site

Maximum contaminant levels detected in this northeast plume were 400 µg/L (carbon tetrachloride) and 200 µg/L (chloroform).

The groundwater extraction system, installed as part of ERA in 1988, proved effective in controlling the migration of contaminated water from the Site. The contaminant plume to the northeast of the Site identified during CCC/USDA's 1991-1992 investigations was beyond the capture zone of the existing GWEX and is believed to have migrated from the source area before the ERA remedial system began operation. This northeast plume also needed to be captured and treated to comply fully with the ROD. To meet this objective, modifications for the remedial system were proposed by CCC/USDA in 1993 and approved by EPA and the state of Nebraska. The modifications involved installing a supplementary groundwater extraction well (SGWEX) (Figure 3) northeast of the Site and pumping the groundwater to the Waverly ERA process building for treatment in the existing air stripper system. Additional monitoring wells were also installed to monitor the progress of the aquifer cleanup. The SGWEX system began operation in 1994.

The Site achieved construction completion status in August 1988. The Preliminary Close Out Report was signed in March 1994. After all performance criteria outlined in the ROD were met, EPA issued a Final Close Our Report in August 2006.

4.3 System Operation/Operation and Maintenance

The ERA systems were designed by an EPA contractor (Woodward-Clyde Consultants) with design specifications and O&M plans described in their February 29, 1988, report, *Treatment Plant Facility Operations and Maintenance Manual for the Expedited Response Action Waverly Groundwater Contamination Site, Waverly, Nebraska.*

The ERA system, comprised of a GWEX, an air stripper for treating the extracted groundwater, and a vapor extraction system (VES) for treating source area soil contamination, began operation in February 1988. In November 1988, Argonne National Laboratory was contracted by USDA to manage the Site, continue sampling, and operate/maintain the ERA system. Since the start-up of the system, the following milestones have been achieved:

Waverly Remediation Project Chronology of Events

Date	Event
1988	GWEX, VES, air stripper, monitoring wells installed by EPA
1990	ROD issued; CCC/USDA took responsibility for the Site
1990-93	Additional studies to comply with ROD identified nórtheastern plume; additional monitoring wells installed
1993	Operation of VES discontinued (EPA approved in 1995)
1993	Installation of SGWEX and additional monitoring wells by CCC
1994	Operation of SGWEX began
1995	Operation of GWEX discontinued with EPA approval
1995	CCC proposed revision to soil gas compliance action levels
1999	Operation of air stripper discontinued with EPA approval
2004	Operation of SGWEX discontinued with EPA approval
2004	Additional monitoring of previously inaccessible property
2005	Additional monitoring of property east of the plume

2005	ESD recommending abandonment of soil gas criteria as a compliance level
2006	2nd Quarter FY 2006 sampling results indicate ROD compliance levels achieved
2006-2009	Continued quarterly groundwater monitoring results indicate compliance levels in the ROD have been maintained

The sampling and analysis program required quarterly sampling and analysis of groundwater for carbon tetrachloride and chloroform. The data were used to track the overall progress toward Site cleanup and to monitor potential off-site migration of contaminated groundwater. Cleanup progress was determined by comparing the measured contaminant concentrations of the environmental samples to specific target concentrations or compliance levels as described in the ROD. The action levels, sampling points, and sampling frequency are listed in Table 1.

4.4 Annual System Operation/Operation & Maintenance Costs

Dates		Total Costs
Sept 2004	Sept 2005	$168,006.80
Sept 2005	Sept 2006	$ 95,468.63
Sept 2006	Sept 2007	$ 54,747.59
Sept 2007	Sept 2008	$ 35,241.64
Sept 2008	Sept 2009	$ 10,721.40*

* Estimate

5.0 Progress Since Last Five-Year Review

Since the third five-year review the following events have occurred:

- The continued sampling of monitoring wells MW-5 and MW-9, as recommended in the third five-year review, has shown the contaminant concentrations are below compliance levels described in the ROD.

- Explanation of Significant Differences (ESD), March 2005 – The significant difference considered here is EPA's proposed deletion of the soil gas compliance criterion stated in the 1990 ROD. The criterion is not necessary to protect human health and the environment and is no longer appropriate under the current EPA guidance. The soil gas compliance level criterion stated in the 1990 ROD is a combined action level of 6.5 micrograms per cubic meter ($\mu g/m^3$) for carbon tetrachloride and chloroform that was based on "acceptable concentrations for indoor air" as specified by the Agency for Toxic Substance and Disease Registry (ATSDR) for residential basements utilizing the risk factor (R) $=10^{-4}$ and the Hazard Index (HI) =1. This recommended level failed to account

for the soil gas to indoor air attenuation factor. The indoor air attenuation factor can range from 0.01 to 0.001 or less depending on site-specific conditions. EPA's *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils*, dated September 19, 2002, elaborates on these attenuation factors.

The specific sequential approach outlined in this guidance was applied to the Site to adequately identify potential exposure pathways and receptors that may be at risk. The results of the reevaluation of the Waverly soil gas compliance level, utilizing the 2002 guidance, indicated that since the contaminants were at such a depth (30 to 35 feet below ground surface) that it was highly unlikely that any vapors would reach any potential receptors so there were no complete pathways or no potential risks to human health associated with soil gas levels. The soil gas compliance criterion level, as described in the 1990 ROD, is therefore not needed as a compliance criterion. The other compliance criteria established in the ROD for this Site are more quantitative, reproducible, and verifiable and provide a more realistic assessment and description of the Site's cleanup status and effectiveness of the remedial system selected in the ROD.

- Final Remedial Action Report, June 2006 – This report was prepared by USDA utilizing EPA's *Close Out Procedures for National Priorities List Sites (*OSWER Directive 9320.2-09A-P*)* and documents that the remedial action at the Site has been completed, cleanup goals have been achieved, and a final inspection has been completed.

- Final Close Out Report, August 2006 – This report documents that EPA Region 7 has completed all response actions for the Site in accordance with *Close-Out Procedures for National Priorities List Sites* (OSWER Directive 9320.2-09A-P) and that the cleanup goals established in the 1990 ROD have been achieved.

- Notice of Intent to Delete/Direct Final Notice of Deletion, Waverly Groundwater Contamination Site, September 2006 – EPA Region 7 published a Notice of Intent to Delete/Direct Final Notice of Deletion of the Site, located near Waverly, Nebraska, from the NPL. The NPL, promulgated pursuant to section 105 of CERCLA of 1980, as amended, is Appendix B of 40 CFR Part 300, which is the NCP. This direct final deletion is being published by EPA with concurrence of the state of Nebraska through the Nebraska Department of Environmental Quality (NDEQ) because EPA has determined that responsible parties or other persons have implemented all appropriate actions required and, therefore, no further remedial actions pursuant to CERCLA are appropriate. The Notice of Intent to Delete (*Federal Register Notice FRL-8220-3*) provided notice to the public on the public comment period. The public comment period closed on October 19, 2006. The Site was deleted from the NPL on November 20, 2006 (*Federal Register Notice FRL-8220-4*).

In conjunction with the deletion notice, the announcement stated that in accordance with the ROD, groundwater sampling and monitoring at the Site were required until the final five-year review is conducted in 2009.

6.0 Five-Year Review Process

6.1 Administrative Component

The Site's five-year review was led by Jeff Field EPA Region 7 RPM, and Yuliya Vishnevskaya from NDEQ assisted in the review as the representative for the support agency.

The Review components included:

- Community Involvement
- Document Review
- Data Review
- Site Inspection
- Interviews
- Five-Year Review Report Development and Review

6.2 Community Involvement

Activities to involve the community in the five-year review were initiated with a meeting in late January 2009 between the RPM and the Community Involvement Coordinator for the Site. The notice announcing the commencement of the five-year review process was published in the local newspaper on February 12, 2009. On February 2, 2009, a notice stating the same was sent to the local and state health departments, county commissioners, city council members, and other local and state officials. A fact sheet was also made available on EPA's Web site on February 11, 2009.

Once final, a notice will be sent to the same local and state offices announcing that the five-year review report for the Site has been completed and that the results of the review and report will be available to the public at the Waverly City Hall and EPA Region 7 Record Center.

6.3 Document Review

This five-year review consisted of a review of all relevant documents including O&M records and monitoring data (See Attachment 1). Applicable groundwater cleanup standards, as listed in the 1990 ROD, were reviewed (See Table 1).

6.4 Data Review

Groundwater

The latest *Quarterly Report for Waverly, Nebraska, Expedited Response Action, Second Quarter, FY 2009* indicated that the contaminants of concern (carbon tetrachloride and chloroform) were not detected in monitoring wells MW05 and MW09 (Figure 3).

Surface Water

Since the pumping of SGWEX was discontinued in September 2004, the discharge of groundwater to surface water has ceased. Prior to SGWEX being shut down, monthly compliance samples collected at the point of discharge into Salt Creek showed levels below the National Pollutant Discharge Elimination System (NPDES) discharge limits for both carbon tetrachloride and chloroform.

Soil

Action levels for soils were set at 1.1 milligrams per kilogram (mg/kg) and 1.7 mg/kg for carbon tetrachloride and chloroform, respectively (Table 1). Because the initial soil samples from the Site were in compliance with the action levels, no additional soil sampling was required.

Soil Gas

An ESD, March 2005 – The significant difference considered here is EPA's proposed deletion of the soil gas compliance criterion stated in the 1990 ROD. The criterion is not necessary to protect human health and the environment and is no longer appropriate under the current EPA guidance. The soil gas compliance level criterion stated in the 1990 ROD is a combined action level of 6.5 $\mu g/m^3$ for carbon tetrachloride and chloroform that was based on "acceptable concentrations for indoor air" as specified by ATSDR for residential basements utilizing the risk factor (R) $=10^{-4}$ and the Hazard Index (HI) =1. This recommended level failed to account for the soil gas to the indoor air attenuation factor. The indoor air attenuation factor can range from 0.01 to 0.001 or less depending on site-specific conditions. EPA's *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils*, dated September 19, 2002, elaborates on these attenuation factors.

The specific sequential approach outlined in this guidance was applied to the Site to adequately identify potential exposure pathways and receptors that may be at risk. The results of the reevaluation of the Waverly soil gas compliance level, utilizing the 2002 guidance, indicated that since the contaminants were at such a depth (30 to 35 feet below ground surface) that it was highly unlikely that any vapors would reach any potential receptors so there were no complete pathways or no potential risks to human health associated with soil gas levels. The soil gas

compliance criterion level, as described in the 1990 ROD, is therefore not needed as a compliance criterion. The other compliance criteria established in the ROD for this Site are more quantitative, reproducible, and verifiable and provide a more realistic assessment and description of the Site's cleanup status and effectiveness of the remedial system selected in the ROD.

Air

Combined VOC emissions from the VES and air stripper system were set at 0.0147 grams per second (g/s) (total carbon tetrachloride and chloroform) with long-term monitoring required at quarterly intervals while the system was in operation. Air emissions were calculated quarterly from March 1992 until the shutdown of VES in 1993. During this period, the total air emissions decreased from 0.0007 to 0.0001 g/s, substantially below the allowed rate. The air emissions rate at the time of the ROD in March 1992 was 0.0011g/s.

6.5 Site Inspection

A site inspection was conducted on July 7, 2009, by the EPA RPM, representatives from Argonne National Laboratory, and Tony's Cement Works (USDA's O&M contractor). (See Attachment 3.) The purpose of the inspection was to assess the general condition of the facility, monitoring wells, and extraction wells

6.6 Interviews

During the Site inspection, the O&M contractor was interviewed. The Project Manager from USDA, Steve Gilmore, was also interviewed through a course of several conversations. No significant problems regarding the Site were identified during the interviews.

7.0. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy implemented for the Site included a soil vapor extraction system, pump-and-treat, and groundwater monitoring. The intended function of the remedy was to limit exposure to contaminants of concern from the former USDA grain storage facility through containment and active remediation and to monitor for any off-site migration.

A review of decision documents, O&M monitoring data, applicable and relevant or appropriate requirements, risk assumptions, and the results of the Site inspection indicates that the remedy functioned as intended by the ROD which has resulted in the achievement of compliance levels.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

Changes in Standards and TBCs.

Have there been changes to risk-based cleanup levels or standards identified as Applicable or Relevant and Appropriate Requirements in the Record of Decision that call into question the protectiveness of the remedy?

No cleanup levels were presented in our copy of the fourth five-year review report though those levels can be found in other site-related documents. In its discussion of contaminated soil, page 9 of the ROD calculates an excess lifetime cancer risk level, based on a residential use scenario, of 4.86E-07. It also calculates an excess lifetime cancer risk level, based on an on-site worker scenario, of 0.57E-07. The assumptions and toxicity values used to derive those risk estimates are not provided. The table below compares the maximum contaminant soil concentrations presented in the ATSDR Health Consultation with the health-based screening values found in EPA's Regional Screening Tables.

(http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm)

Contaminant	Maximum on-site concentration, mg/kg	EPA Residential Use Screening Value, mg/kg	EPA Industrial Use Screening Value, mg/kg
carbon tetrachloride	0.40	0.25	1.3
chloroform	0.073	0.30	1.5

This table shows that the maximum concentration of carbon tetrachloride found in soil at the Site in 1987 slightly exceeded EPA's current residential screening value. A simple comparison of the ratios of screening values to Site concentrations indicates that the lifetime excess cancer risk from this slight exceedance is about 1.6E-06, using EPA's residential exposure assumptions and toxicity values. This lifetime excess cancer risk is well within the excess cancer risk range of 1E-04 to 1E-06 which EPA generally considers to be acceptable (EPA 1990).

Are there newly promulgated standards that call into question the protectiveness of the remedy?

The fourth five-year review did not find any newly promulgated standards that call into question the protectiveness of the remedy.

Have TBCs used in selecting cleanup levels at the site changed in a way that could affect the protectiveness of the remedy?

The fourth five-year review did not find any uses of TBCs in selecting cleanup levels for this Site.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed (e.g., industrial to residential, commercial to residential)?

Page 2 of the ESD states, "The property east of 141st Street and South Waverly Road…has recently been purchased for the construction of a housing development. [The] groundwater flow direction could potentially move the remaining small plume under homes being planned for this development."

EPA is unaware of the current status of this planned development. Regardless, because quarterly groundwater monitoring has shown contaminant levels to be below detection limits for a number of years, property use is not restricted because the cleanup allows unlimited use and unrestricted exposure. Post-deletion sampling results have consistently been below compliance levels indicating the remediation is complete.

Have any human health or ecological routes of exposure or receptors changed or been newly identified (e.g., dermal contact where none previously existed, new populations or species identified on site or near the site) that could affect the protectiveness of the remedy?

The fourth five-year review did not find any changed or newly identified routes of human health or ecological routes of exposure.

Are there newly identified contaminants or contaminant sources?

The fourth five-year review did not find any newly identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the decision documents (e.g., byproducts not evaluated at the time of remedy selection)?

The fourth five-year review did not find any unanticipated toxic by-products.

Have physical site conditions (e.g., changes in anticipated direction or rate of groundwater flow) or the understanding of these conditions (e.g., changes in anticipated direction or rate of groundwater flow) changed in a way that could affect the protectiveness of the remedy?

The fourth five-year review did not find any change in physical Site conditions which could affect the protectiveness of the remedy.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for contaminants of concern at the site changed in a way that could affect the protectiveness of the remedy?

The toxicity values for carbon tetrachloride and chloroform have both been updated in EPA's Integrated Risk Information System (IRIS) database since the signing of the ROD (http://cfpub.epa.gov/ncea/iris/index.cfm). As noted above, this has resulted in the 1987 maximum soil concentration of carbon tetrachloride on-site slightly exceeding the current EPA screening value for a residential scenario. The maximum concentration of carbon tetrachloride remains below the EPA screening value for the industrial use scenario.

Have other contaminant characteristics changed in a way that could affect protectiveness of the remedy?

The fourth five-year review did not find any other changes to contaminant characteristics that could impact the protectiveness of the remedy.

Changes in Risk Assessment Methods

Have standardized risk assessment methodologies changed in a way that could affect the protectiveness of the remedy?

EPA has significantly revised several of its risk assessment methodologies since the signing of the ROD in 1990. However, these revisions do not impact the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Have newly found ecological risks been found?

The fourth five-year review did not find any newly identified ecological risks.

Are there impacts from natural disasters (e.g., a 100-year flood)?

The fourth five-year review did not find any natural disasters that have occurred on this Site.

Has any other information come to light which could affect the protectiveness of the remedy?

The fourth five-year review did not find any other information which could affect the protectiveness of the remedy.

Technical Assessment Summary

Based on the data reviewed, the Site inspection, and interviews, the remedy that was implemented at the Site performed as intended in the ROD resulting in achieving compliance levels in 2006.

8.0 Issues

The need for further groundwater monitoring.

9.0 Recommendations and Follow-Up Actions

Since quarterly groundwater monitoring conducted since November 2006 has shown that contaminant levels remain well below the compliance levels described in the ROD, further groundwater monitoring will be discontinued.

10.0 Protectiveness Statement

The remedy at the Site has achieved the compliance criteria outlined in the ROD and is therefore protective of human health and the environment.

11.0 Next Review

Because no contaminants remain on-site above compliance levels as outlined in the ROD and there is no need for additional monitoring, this will be the final five-year review report for the Site.

Figures

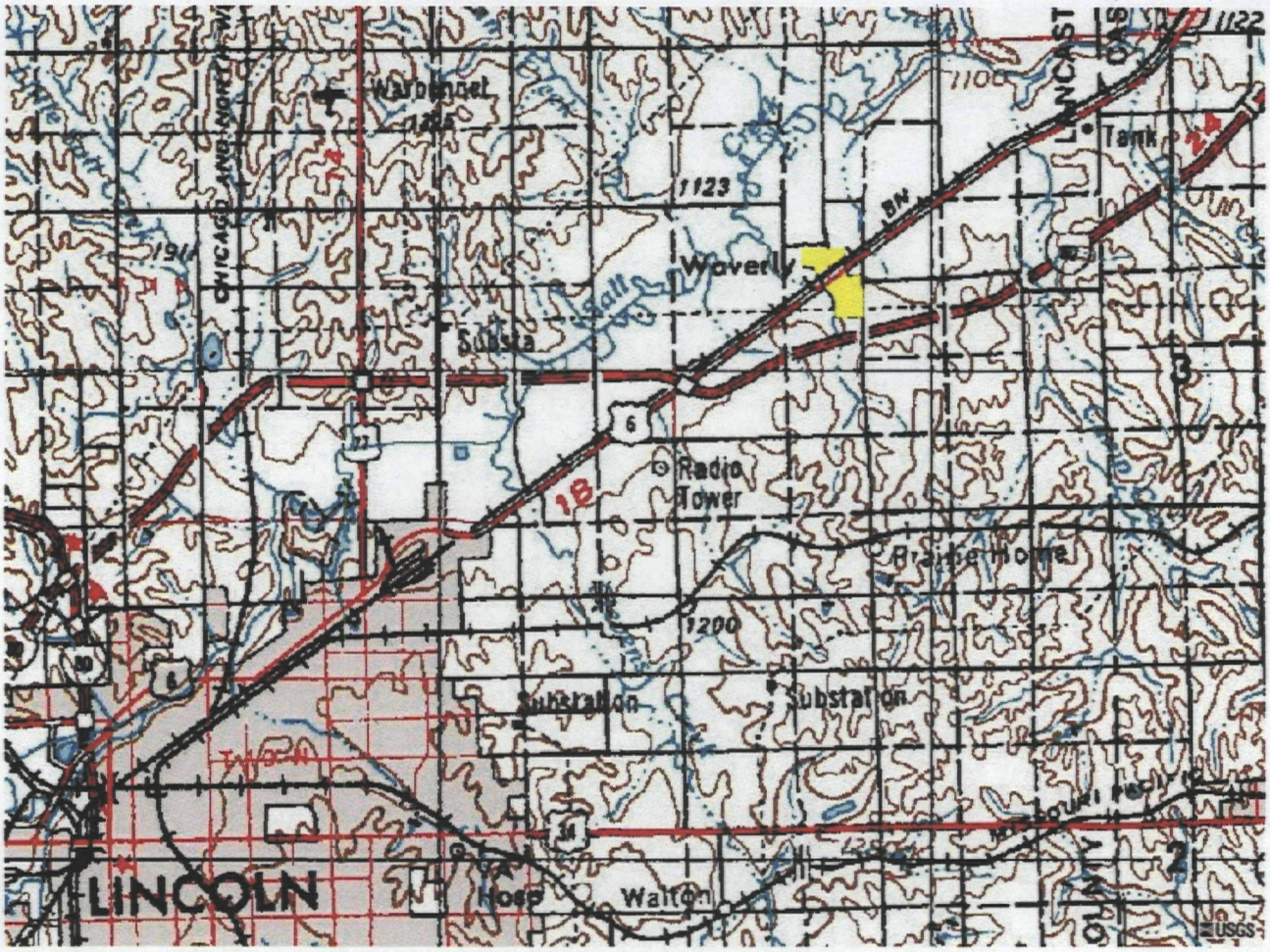

Figure 1: General location of Waverly, Nebraska

Figure 2: Waverly, Nebraska

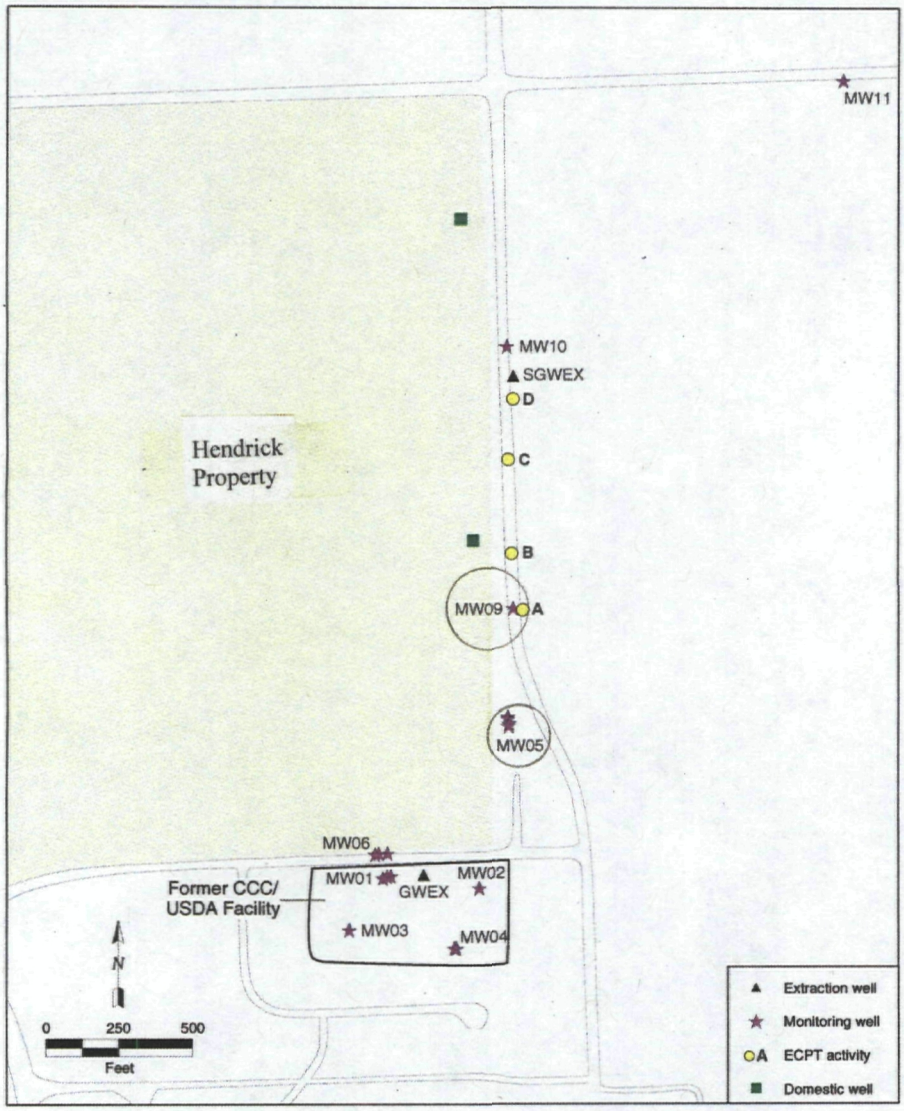

Figure 3: Location of monitoring well MW09 and monitoring well cluster MW05.

Tables

Table 1

Record of Decision
Compliance Points and Sampling Frequency

Media	Compliance Points	Action Level *Carbon Tet.*	Action Level *Chloroform*	Compliance *Period*
Air	Combined VOC emissions from VES and Air Stripper	0.147 g/s	-	During all operations
"	Ambient Air	1.25 g/m^3 Above background	-	NA
Ground water	All on-site monitoring wells (1-4)	5.0 g/L	3.8 g/L	1 year (4 events after GWEX wells are off)
Surface Water	Air Stripping System discharge	6.95 g/L	5.0 g/L	During all operations
Soil	Former Federal Grain Facility	1.1 mg/kg	1.7 mg/kg	NA
Soil Gas*	SGMW 1-5 (A, B, & C) and all VES wells	6.5 g/m^3	-	1 year (4 events)

*Explanation of Significant Differences, March 2005 removed soil gas as a compliance criterion.

Attachments

Attachment 1

Documents Reviewed

Soil Gas Monitoring Well Contaminant Concentrations, February 1988

ATSDR Health Consultation, May 1988

EPA Superfund Record of Decision: Waverly Groundwater Contamination Site, EPA ID NED 980862718, September 1990

Final Work Plan: Expedited Remedial Action, Waverly Contaminated Groundwater Site, Waverly, Nebraska, August 1991

Record of Decision Site Investigation Report, Waverly, Nebraska, February 1992

Supplement to ROD Decision Site Investigation Report, Waverly, Nebraska, July 1992

Final Design Report for Modifications to the Waverly Groundwater Treatment System, Waverly, Nebraska, May 1993

Final Report: Second Performance Evaluation of the Waverly Remediation Systems, Expedited Response Action, Waverly, Nebraska, May 1999

Second Quarter FY 2004 Groundwater Sampling Report, Expedited Response Action, Waverly, Nebraska, April 2004

EPA Superfund Third Five-Year Review, Waverly Groundwater Contamination Site, Waverly, Nebraska, August 2004

EPA Superfund Explanation of Significant Difference, Waverly Groundwater Contamination Site, Waverly, Nebraska, March 2005

Final Remedial Action Report: Waverly Groundwater Contamination Site, Waverly, Nebraska, USDA, June 2006

EPA Superfund Final Close-Out Report, Waverly Groundwater Contamination Site, Waverly, Nebraska, August 2006

EPA Notice of Deletion, Waverly Groundwater Contamination Site, Waverly, Nebraska, September 2006

Federal Register (FRL-8220-3) Notice of Intent to Delete, Waverly Groundwater Contamination Site, Waverly, Nebraska, September 2006

Federal Register (FRL-8220-4) Direct Final Notice of Intent to Delete, Waverly Groundwater Contamination Site, Waverly, Nebraska, September 2006

Second Quarter FY 2009 Groundwater Sampling Report, Expedited Response Action, Waverly, Nebraska, February 2009

Attachment 2

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Waverly Groundwater Contamination	**Date of Inspection: July 7, 2009**
Location and Region: Waverly, Nebraska/ Region 7	**EPA ID: NED980862718**
Agency, office, or company leading the five-year review: U.S. EPA Region 7	**Weather/temperature: Clear/ 75**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☐ Institutional controls
- X Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____

- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ■ Inspection team roster attached ■ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** __Tony Ruhge_____ ____Project Manager___ ___07/07/2009
   Name Title Date
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

■ O&M manual	■ Readily available	☐ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	■ N/A
☐ Maintenance logs	■ Readily available	☐ Up to date	☐ N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ■ Readily available ☐ Up to date ☐ N/A
   ■ Contingency plan/emergency response plan ■ Readily available ☐ Up to date ☐ N/A
   Remarks_____

3. **O&M and OSHA Training Records** ■ Readily available ☐ Up to date ☐ N/A
   Remarks_____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	■ N/A
■ Effluent discharge	☐ Readily available	☐ Up to date	☐ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	■ N/A
☐ Other permits_____	☐ Readily available	☐ Up to date	☐ N/A

   Remarks: State NPDES permit closed out after discharge stopped.

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ■ N/A
   Remarks_____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ■ N/A
   Remarks_____

7. **Groundwater Monitoring Records** ☐ Readily available ■ Up to date ☐ N/A
   Remarks_____

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ■ N/A
   Remarks_____

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☐ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	■ N/A

   Remarks_____

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ■ N/A
    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ■ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other: TCW Construction

2. **O&M Cost Records**

☐ Readily available ■ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From	Sept 2004 (Date)	To Sept 2005 (Date)	$ 168,006.80 (Total cost)	☐ Breakdown attached
From	Sept 2005 (Date)	To Sept 2006 (Date)	$ 95,468.63 (Total cost)	☐ Breakdown attached
From	Sept 2006 (Date)	To Sept 2007 (Date)	$ 54,747.59 (Total cost)	☐ Breakdown attached
From	Sept 2007 (Date)	To Sept 2008 (Date)	$ 35,241.64 (Total cost)	☐ Breakdown attached
From	Sept 2008 (Date)	To Sept 2009 (Date)	$10,721.40 (Total cost)	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: N/A

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ■ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A

Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ■ N/A

Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ■ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ■ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ■ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ■ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ■ N/A
Violations have been reported ☐ Yes ☐ No ■ N/A
Other problems or suggestions: ☐ Report attached

_____
_____INSTITUTIONAL CONTROLS NOT INCLUDED IN ROD _____
_____
_____

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ■ N/A
Remarks _____
_____
_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident
Remarks _____
_____

2. **Land use changes on site** ☐ N/A
Remarks No land use changes. Lancaster County maintains district roads maintenance office on site.

3. **Land use changes off site** ■ N/A
Remarks _____
_____

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A
Remarks _____
_____

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS ☐ Applicable ■ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly.established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks_____
   _____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ■ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ■ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ■ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ■ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer ☐ Applicable ■ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ■ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ■ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ■ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ■ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____

C. Treatment System ☐ Applicable ■ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   ■ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
   ■ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ■ N/A
Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The soil vapor extraction and pump-and-treat system have effectively removed soil and groundwater contamination to meet compliance levels described in the ROD.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Attachment 3

Five-Year Review Inspection Attendance Roster

The following is a list of individuals attended this five-year review inspection.

Name	Title/Position	Organization	Date
Tony Ruhge	O&M Project Manager	TCW Construction	July 7, 2009
Bob Sedivy	Field Project Manager	Argonne National Laboratory	July 7, 2009
Jeff Field	Project Manager	U.S. EPA	July 7, 2009